

**REMARKS**

Applicants appreciate the consideration shown by the Office as evidenced by the Office Action mailed on 17 November 2004. In that Office Action, the Examiner rejected claims 1-32. In this Response, Applicants have amended claims 1, 18, and 19, and have cancelled claim 16. Applicants respectfully request favorable reconsideration in light of the above amendments and the following remarks.

**Claim Rejections - 35 U.S.C. §103****A. Whalen et al. in view of Klug et al. or Cooper et al.**

Claims 29-32 were rejected under 35 U.S.C. §103(a) as being unpatentable over Whalen et al. in view of either Klug et al. or Cooper et al. Applicants respectfully traverse this rejection.

Whalen et al. ("Whalen") teaches away from the use of "a single piece structure comprising at least one cavity, said cavity configured to correspond to a desired configuration of at least one internal cooling circuit of a gas turbine component," as recited by independent claim 29 and supported in paragraph [0013] of the present application. Whalen describes a lithographic method for forming a ceramic casting. The method involves fabricating a sacrificial die by stereolithography, introducing a ceramic slurry, then destroying the die via dissolution or decomposition, after curing the slurry, to leave behind a cast ceramic article. However, Whalen's process necessitates the use of multiple piece dies where "enclosed portions are described." Column 3, lines 30-35. Thus Whalen fails to teach, suggest, or disclose the use of a single piece structure to cast a part such as recited in claim 29 of the present application.

The Examiner applies Klug et al. and, in the alternative, Cooper et al., to remedy the failure of Whalen to teach the use of a particular configuration for the cavity. However, neither of these references suffices to overcome the deficiency noted above related to the use of multiple piece dies, as opposed to single piece dies, to make complicated parts. These references merely describe certain casting processes that use cavities configured to produce internal cooling channels. Nothing is taught, suggested, or disclosed regarding the use of a "single piece structure", for example.

As none of the applied references, alone or in combination, teach, suggest, or disclose all elements recited by Applicants' claim 29, it is respectfully submitted that claim 29 and its dependent claims 30-32 are allowable. Favorable reconsideration is respectfully requested.

B. Woodrum et al. in view of Whalen et al.

Claims 1-3, 5-20, 22-24, and 27-28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Woodrum et al. in view of Whalen et al. Applicants respectfully traverse this rejection.

Woodrum et al. discloses an investment casting method for turbine components. A fugitive pattern is placed inside a multi-piece, permanent core molding die (M in Figure 4; D1 and D2 in figure 7), and a ceramic slurry is introduced into the resulting assembly to form a core. The fugitive pattern is removed by destructive means, such as heating, but the die used to make the core is not destroyed and is retained after removing the core from the die. The fugitive core, in certain cases, may be fabricated using stereolithographic methods.

Whalen et al., as noted above, describes a lithographic method for forming a ceramic casting. The method involves fabricating a sacrificial die by stereolithography, introducing a ceramic slurry, then destroying the die via dissolution or decomposition, after curing the slurry, to leave behind a cast ceramic article.

The Examiner notes that Woodrum et al. fails to teach, suggest, or disclose a method comprising providing a single-piece sacrificial die, as recited by independent claims 1, 18, and 19 of the present application, and combines Whalen et al. in an attempt to overcome this deficiency. However, Applicants respectfully submit that the combination does not teach, suggest, or disclose the subject matter claimed by the aforementioned independent claims of the present invention.

Whalen, as noted above, teaches away from the use of single piece dies for processing certain parts of interest in the present application. "Multi part molds become necessary where...enclosed portions are described..." Col. 3, lines 30-35. Independent claims 1, 18, and 19 recite "providing a single-piece sacrificial die, said die comprising at least one internal cavity and having an internal structure corresponding to at least one internal cooling circuit of said component." One skilled in the art thus would not be motivated by Whalen to employ a single piece

die having a complex internal structure of the type recited in the present claims, because Whalen teaches that dies with complex internal structures must be made of multiple pieces.

There is no motivation to combine Woodrum with Whalen to develop a process using a single piece die. Woodrum, which uses a multi piece die, is directed at the production of multi wall cores, which by definition describe internal structures. See Woodrum, col. 2, lines 45 and Figures 1-3. Whalen teaches that such structures must be formed using multi piece dies. See Whalen, col. 3, lines 30-35. Thus, there is no suggestion in this combination that single piece dies can or should be used to form articles having complex internal structures.

Moreover, Woodrum et al. teaches away from the use of stereolithographic processes of the type disclosed by Whalen et al. for making integral patterns used in the process of forming cores. According to Woodrum et al., the fugitive pattern elements may be made by "injection molding, stereolithographic, and other techniques." Col. 2, lines 56-59. Individual pieces of the pattern can be "made and joined together by suitable adhesive to form pattern assembly 20." Col. 2, line 66 – col. 3, line 1. Applicants note that in this description of a multi-piece method, there is no further elaboration as to what methods may be used to make the pieces, and thus, presumably, any of the "injection molding, stereolithographic, and other techniques" referenced above would be suitable for Woodrum et al.'s method. However, Woodrum et al. next goes on to describe a different method where the pattern can be all one piece. In this description, there is precise specification as to the method for forming the single piece pattern, unlike the description for the multi-piece pattern method: "Alternately, the pattern 20 can be formed as one-piece **by injection molding** of wax or other suitable pattern material in a pattern die cavity with the pattern elements P1, P2, P3 integrally connected at molded regions." Clearly, Woodrum et al. teaches that a single piece pattern is to be processed differently than a multi-piece pattern, in that here Woodrum et al. makes a special limitation as to the method to be used when making an integral pattern. Woodrum et al. was clearly aware of the uses of stereolithography, because the use of this technology was described in some detail for the multi-piece pattern method, yet the author chose to exclude this technique from applications where a single-piece pattern is to be used. One skilled in the art would conclude from Woodrum et al. that stereolithography, of the type described in Whalen et al., is not an appropriate technology for use in integral pattern applications. Supporting this observation is the fact that Whalen et al. was issued more than 2 years prior to Woodrum et al., and yet Woodrum et al. still chose to limit the use of lithographic techniques to multi-piece pattern methods.

In summary, one skilled in the art would not combine the stereolithographic technique of Whalen et al. with the investment casting technique of Woodrum et al. because Woodrum et al. teaches away from the use of stereolithographic techniques where integral, one-piece patterns are to be used to fabricate complex ceramic cores. Therefore, Applicants respectfully submit that claims 1, 18, and 19, and their respective dependent claims rejected herein, are patentably distinct from the applied combination of references.

#### C. Rejections of dependent claims

The Examiner further presented two other combinations of references to reject claims 4 and 21, and claims 25 and 26, respectively. Claim 4 depends from claim 1, and claims 21, 25, and 26 depend from claim 19. These base claims are believed to be allowable for the reasons set forth above, and thus Applicants respectfully submit that claims 4, 21, 25, and 26 are allowable due to their dependencies from allowable base claims.

#### Conclusion

In light of the remarks presented herein, Applicants believe that this serves as a complete response to the subject Office Action. If, however, any issues remain unresolved, the Examiner is invited to telephone the undersigned at the number provided below.

Respectfully submitted,



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